



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,211	03/04/2002	James M. Tour	1789-10000	3441
23505	7590	03/18/2005	EXAMINER	
CONLEY ROSE, P.C. P. O. BOX 3267 HOUSTON, TX 77253-3267			LEADER, WILLIAM T	
			ART UNIT	PAPER NUMBER
			1742	

DATE MAILED: 03/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/090,211

Applicant(s)

TOUR ET AL.

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 9-9-2002.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 10, 11, 14 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Kayyem et al (6,090,933).

4. The Kayyem et al patent is directed to methods of attaching conductive oligomers to electrodes. The conductive oligomers are referred to as 'molecular wires' and are considered to correspond to the molecular device molecules recited in the instant claims. See column 8, lines 45-49. The conductive oligomers are attached to an electrode which may be made of a metal such as gold. See column 23, lines 22-48). The conductive oligomers include metal-bonding termini which may be a sulfur

moiety. See column 23, line 62 to column 24, line 14. In a preferred embodiment, the conductive oligomers are covalently attached to a gold electrode via sulfur linkages. Traditional protecting groups are used. The subunit of the conductive oligomer which contains the sulfur atom for attachment to the electrode is protected with a protecting group such as an ethyl-pyridine or trimethylsilylethyl group. See column 37, lines 15-35. Thus, Kayyem et al disclose the step of providing a mixture comprising molecular device molecules in solution, each molecular device having a metal-bonding terminus protected by a protective group as recited in instant claim 10. Kayyem et al exposed a gold electrode having areas of unreacted gold to a solution containing the conductive oligomer molecular wire. The wire still had the ethyl-pyridine protecting group on it. The wire was exposed to a solution containing ammonium hydroxide. This removed the protecting group from the wire and allowed it to bind to the gold. See column 64, lines 53-64. Thus, Kayyem et al disclose the remaining steps recited in instant claims 10 and 11. Kayyem et al additionally disclose that the conductive oligomer may be made of phenyl with a variety of substitution groups such as ethyl. This suggests the limitation of instant claim 14. The backbone of the molecule shown in figure 4 of Kayyem et al is the same as that shown in figure 1 of applicant. It is not apparent that the device recited in instant claim 20 differs from that disclosed by Kayyem et al.

5. Claims 19 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Keen (US 6,060,327).

6. The Keen patent is directed to molecular wire injection sensors and method of making them. The sensors include polymer strands which may be organic conducting polymers. See column 7, lines 55-63. These conductive polymers strands correspond to the molecular device molecules recited in the instant claims. In a preferred embodiment, a first electrodeposition cycle affixes strands of conducting polymer on a substrate. The process is illustrated in figure 4A. A medium containing the polymer to be deposited is contacted with the substrate. An electric potential is applied to the substrate to deposit polymer strands. See column 20, line 57 to column 21, line 22. Thus, the steps of instant claim 19 are disclosed by Keen. It is not apparent that the device recited in instant claim 20 differs from that disclosed by Keen.

7. Claims 20 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Reed (5,589,692).

8. The Reed patent is directed to sub-nanoscale electronic systems and devices. The devices disclosed by Reed include conductive oligomers such as thiophene-ethynylene oligomers. The ends of the oligomers are functionalized with groups such as the thiol group and the carboxyl group. See column 14, lines 51-57. Reed discloses that in making devices, oligomers with different functional groups can be

selectively attached to closely spaced metal pads. A thiol group can be selectively attached to a gold metal pad while a carboxyl group can be attached to an aluminum pad. Pad spacing may be less than 100 angstroms. See column 25, lines 5-23. The structure of the devices disclosed by Reed is the same as that of the circuits recited in instant claims 20 and 21.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-4, 7-14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keen in view of Kayyem et al.

12. Keen and Kayyem et al are interpreted and applied as above. The process recited in instant claim 1 differs from Keen by reciting the step of impeding bonding of the molecular device molecules to the substrate. According to applicant's specification, the manner in which impeding is accomplished is to provide a protective group on the functionalized end of the molecular device. ("It has been discovered that the presence of the protective group sufficiently slows the rate of formation of thiolate in a basic solution, or thiol in an acid solution, that the voltage applied to an electrode surface will cause the molecules to assemble on that surface significantly faster than on a non-charged surface in the same solution." See page 5, lines 14-17 of the specification.) As noted above, Kayyem et al disclose the use of protective groups to protect the conductive oligomers. The protective group is removed to allow the oligomer to bond to the substrate. The removal may take place in the solution containing the oligomers in which the substrate is placed to cause deposition. Kayyem et al call this "in situ deprotection" (column 64, lines 61-64). It would have been obvious at the time the invention was made to have utilized a protective group as taught by Kayyem et al in the process of Keen because the conductive oligomer would have been protected. Since this is the same method used by applicant, the relative rates recited in claims 1-4 would have been expected to

occur. The limitation of claim 8 is similar to that of claim 14 discussed above. With respect to claim 9, Kayyem et al disclose the use of a thiol terminated oligomer as noted above. Keen also discloses the use of a thiol terminated oligomer to bond to a gold electrode (column 26, lines 51-54). With respect to the application of voltage in claims 13 and 17, as noted above Keen discloses the application of a voltage to promote deposition. Since the deprotection may occur in situ as shown by Kayyem et al, this application of voltage would also serve to activate the de-protected oligomers.

13. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keen in view of Kayyem et al as applied to claims 1-4, 7-14 and 17 above, and further in view of the admitted prior art.

14. Claims 15 recite specific protective groups. The admitted prior art relied on is the discussion at page 5, lines 20-30 of the specification which indicates that the protective groups recited in claims 15 and 16 are protective groups identified in Green et al (Protective Groups in Organic Synthesis, 3rd edition). The use of protective groups taught in this text as the protective groups in Kayyem et al would have been obvious because they are clearly known in the art to be effective protective groups.


15. Claims 5, 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reed in view of Keen and Kayyem et al.

16. Claims 5, 6 and 18 recite the additional steps of providing a second substrate and contacting the second substrate with a second-type molecular device. As noted above, Reed discloses making electrical devices in which different oligomers are attached to two different closely spaced substrates. It would have been obvious at the time the invention was made to have made the device of Reed by utilizing an applied voltage to perform the deposition of the oligomers as taught by Keen and to have protected and then activated the oligomer as taught by Kayyem et al because a desirable deposit of aligned oligomer strands would have been efficiently formed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


William Leader
March 10, 2005


ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700